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Preface

This proceedings book results from the AgEng2018 Agricultural Engineering Conference under auspices of the European Society of Agricultural Engineers, in Wageningen, the Netherlands, from 8-12 July 2018. This book contains the full papers of a selection of abstracts that were the base for the oral presentations and posters presented at the conference. We like to thank all participants, sponsors and the scientific committee of the conference for their indispensable contribution to this event. A special word of thanks goes to the municipality of Wageningen for organising a welcome reception as host city, and the many students and colleagues of chair groups and research institutes of Wageningen University & Research that helped in so many ways to make the conference a success.

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Management System of Small Farm Machinery Hiring Business for Rice Farming Operations in Kampar Region, Indonesia

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Abstract

Development of using farm machines for agricultural operations has created business opportunities for smallholder farmers in rural areas. Custom hire offering machinery services for farmers is one of business models at the farm level which has been adopted widely in many developing countries with different management system and economic benefit depending farming practices. This paper attempts to examine the management system of small farm machinery hire businesses for rice farming operations in Kampar Region. We have surveyed and purposively selected as 20 groups of hire service providers of small farm machinery in the region. Group managers and machine operators were personally interviewed using questionnaires to collect primary data during September – October 2017. The results showed that the small farm machinery hire services were small businesses managed by farmer groups and operated within village area. They managed 2 - 4 kind of farm machines and offered hiring services for their group members according to machine owned with a lower charge rate. The businesses became sources of increasing and diversifying family incomes for smallholder farmers in the region. Moreover, the availability of the farm machinery hire businesses was helpful stallholder farmers to access farm machinery for being mechanized their rice farming operations.

Keywords: Management system, Machinery hiring business, Small-scale rice farming, Kampar region.

1. Introduction

Agricultural mechanization today has widely expanded over the world. However, the application of mechanization in farming practices still differs significantly between developed and developing countries. The present level of the mechanization in the developing countries is still relatively low and differs significantly across the countries (Kienzle et al., 2013) and even from region to region within the country (Singh and Zhao, 2016). It is because many developing counties face various constraints and continue to go on today. Main constrains to develop mechanization are low purchasing power of farmers who are mostly smallholders farmers, lack of well-trained operators and mechanics for making machinery repairs and maintenance, and inadequate maintenance and repair facilities for supporting machinery management system. Twenty years ago, Rijk (1998) confirmed that agricultural sector in developing countries is dominated by small-scale farming, many of which are less than two hectares.

During the last few decades, many developing countries have strived to accelerate the technological transformation of mechanization through introducing small farm machinery for smallholder farmers. The utilization of mechanical power instead of human and animal power offers a potential for increasing agricultural efficiency and productivity primarily food crops. The sustainability of agriculture in the world today cannot be distinguished from the development of farm mechanization at the farm level. Many developing countries have succeeded to significantly increase rice production and achieve self-sufficiency, and even exported rice to other countries.

The agricultural machinery use has been adopted through custom hiring system that helped to increase the utilization of the agricultural machinery in many countries (Abdullah, 2016). Although the operation model may not be compatible with the conditions in every country (Chancellor, 1971), the custom hiring system has been adopted in many developing countries in order to provide farm machinery to smallholder farmers (Koike, 2009; Paman et al., 2010; Paman et al., 2014; Paman et al., 2016; Singh, et al., 2013; Rahman, et al., 2013; Chahall, et al., 2014). The machinery hire services could be provided by governmental agencies as well as private entrepreneurs/co-operatives (Singh, 2013).

In Indonesia, farm machinery hire services have developed and widely expanded over the country and have been small businesses managed by farmer groups. Based on data from Agricultural Department of Indonesia (2011), number of farm machinery hire services groups in Indonesia in 2010 accounted to 12,612 and about 707 (5.6%) were located in the Riau Province. Currently, most of small farmers are increasingly depending on custom hiring of farm machinery to perform farm works, particularly for labour intensive operations such as tillage, threshing, and milling operations. Successful farm machinery business depends greatly on management system adopted by the business. The purpose of this paper is to examine the management system of small farm machinery hire businesses for rice farming operations in Kampar Region.

2. Materials and Methods

This research was carried out using survey method which located in Kampar Region, Riau Province, Indonesia. A total of 20 hire business groups were selected from 15 districts in the region. The districts are rice production areas in Kampar Region and have a high level of mechanization adoption on farm. Most farmers use farm machinery for their farming operations provided by hire business groups. The survey area of the research is showed in Fig. 1.

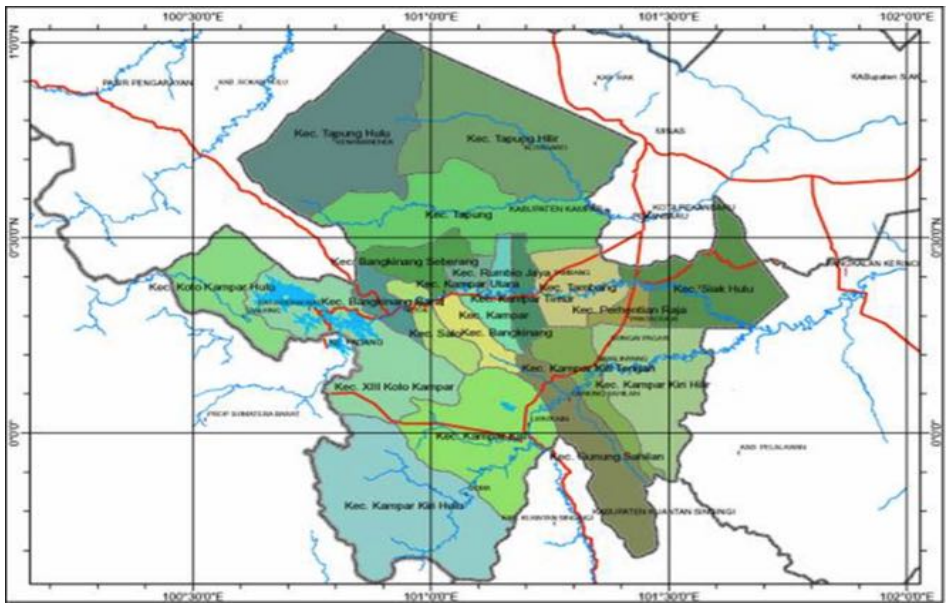

Figure 1. Map of Kampar Region showing the research location.

Data required in this research consisted of primary and secondary data. Primary data obtained through personal interviews with managers of hire business groups, machinery operators, and farmer's group leaders by using questionnaires**.** The collected data included number and type of owned machines, rates of service charge and payment procedures, number farmer groups and their members, and other information corresponding to this research. While, secondary data were collected from Food Crops Service of Kampar Region, Statistical Office of Kampar region and District Offices. The secondary data included type and number of farm machinery in the region, ownership system, and other related data. The collected data were tabulated and then analyzed by using descriptive-quantitative approaches.

3. Results and Discussion

Types and number and of farm machinery on rice farming

Farm machinery in Kampar Region has widely expanded during the last ten years over the region. Most of the farm machinery is still concentrated on the rice production areas. Types and number of farm machines available in the region are still limited (Table 1). The major types of farm machinery on farm today are four-wheel tractors, two-wheel tractors (power tillers), irrigation pump, power threshers, dryers, and rice milling units (RMUs). Therefore, farm operations which can be performed by using farm machines depend on the machine types available, such as land preparation, water pumping, threshing, harvesting, and milling. Paman et al (2018) reported that the high level of mechanization was found on land preparation and milling operations.

Table 1. Type and number of farm machines in Kampar Region in 2016.

No.	Type of machines	Good condition	Breakdown	Total
1	Two-wheel tractor	195	26	221
2	Four-wheel tractor	7	2	9
3	Irrigation pump	257	53	310
4	Power thresher	333	60	393
5	Dryer	17	8	25
6	Rice milling unit (RMU)	70	8	78

Source: Food Crops and Horticulture Services of Kampar Region. 2017

Table 1 shows that the largest number of farm machines is power thresher (393 units) and the second one is irrigation pump (310 units). Two-wheel tractor is found to be 221 units and this tractor type is very popular among farmers for tillage operation. Four- wheel tractor is smallest number (9 units) and this tractor is not suitable for any small-scale farm. Furthermore, the machines are not all in good condition. There are some machines in breakdown condition and the machines are difficult to be repair due to lack of spare parts and mechanics.

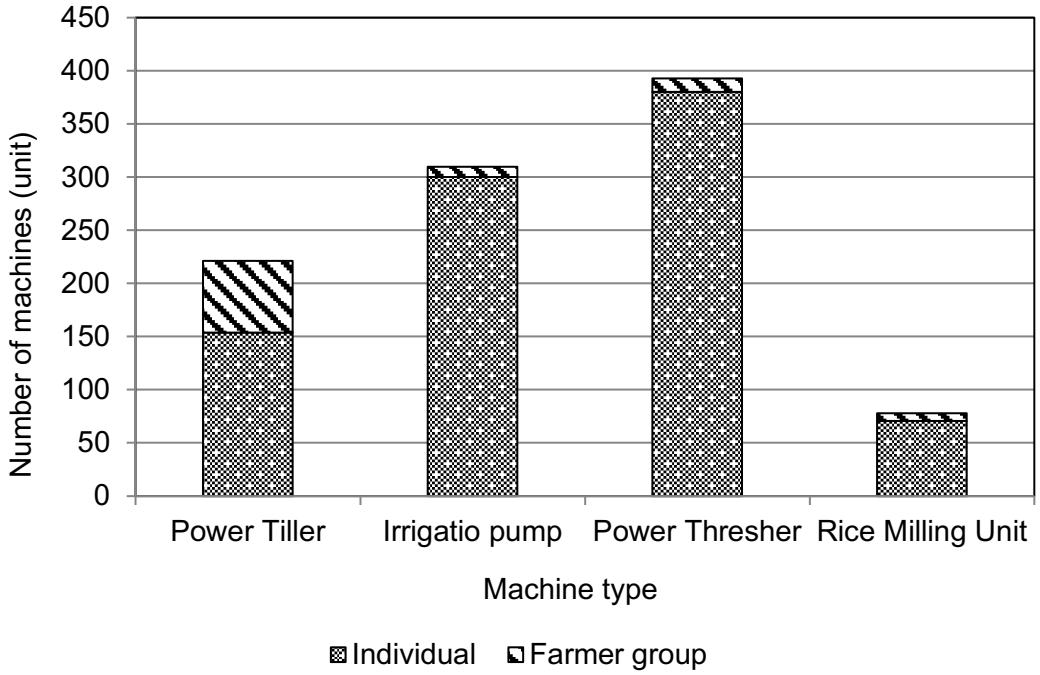

Figure 2. Farm machinery ownership in Kampar region.

Farm machinery in survey areas is owned by individual and hire business groups. Table 2 shows that most of farm machinery is owned by individual. The machines are purchased by farmers themselves and mainly used to work their farms. They also provide hiring services for other farmers to fully use machine capacity and receive money from the services. They usually offer hire services to neighbor farmers who require farm machines to work their farm operations.

Organizational and membership structures of hire business groups

Machinery hire businesses in Kampar Region are managed by farmer groups and individual farmer. The hire service groups have been established in villages which have paddy field areas and produce rice every year. The farm machines managed by the group came from government aid through mechanization development program. There is only one machinery hire business available in each village. The establishment of the groups is to make easy for distributing farm machinery to be managed effective and efficient and then the machines can be accessed easily by smallholder farmers.

Farm machinery hire service is a small business group and involves only by few persons in its operation management. Therefore, form of organizational structure of the business group is very simple and has only few job positions (Fig. 3). It is because of types of job only provide hire services for perform farm operations to group

members. The organization of hiring business group is managed by a manager and assisted by a vice manager, a secretary, and a treasurer. The organizational structure is equipped with three persons as operator, mechanic and group leader. While, village chief and extension officer have a position as advisers in the organizational structure.

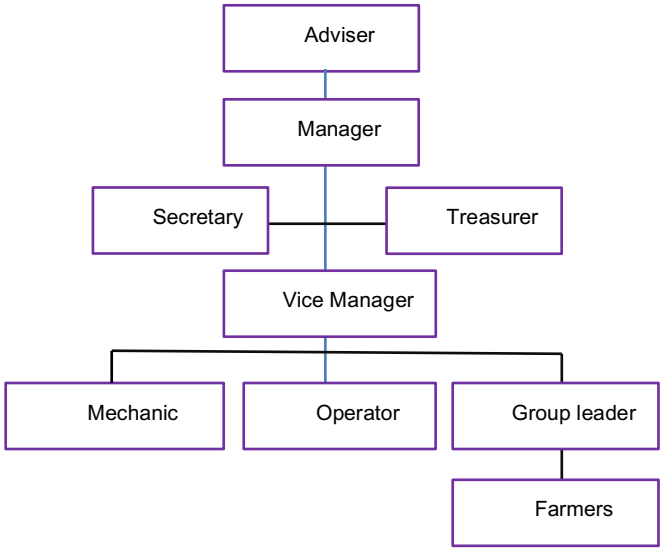

Figure 3. Organizational structure of hire business groups.

There is not monthly salary for manager and other management staffs. They receive wage at the end of season, exception operators. The operator wage is paid in installments during season. The operator wage is calculated as much as 50% from profit obtained from job contract. The rest will be divided for advisers, manager, vice manager, secretary, treasurer, and group leader, but there is no wage from hire business group for mechanic. The mechanic will receive wage from repair and maintenance services. The amount of wage depends on number of job contracts and their position in the organizational structure.

Member of the hire business groups consisted of the whole farmer groups available in a village. The member of the groups is farmers who cultivate rice in the village. Therefore, the number of the group member depends on number of farmer groups and/or rice farmers in the village area, so the number of hire business group member differs across groups. The village that has wide paddy field areas and many farmers has more group or more farmer members. The structural member of hire business groups is presented in Fig. 4.

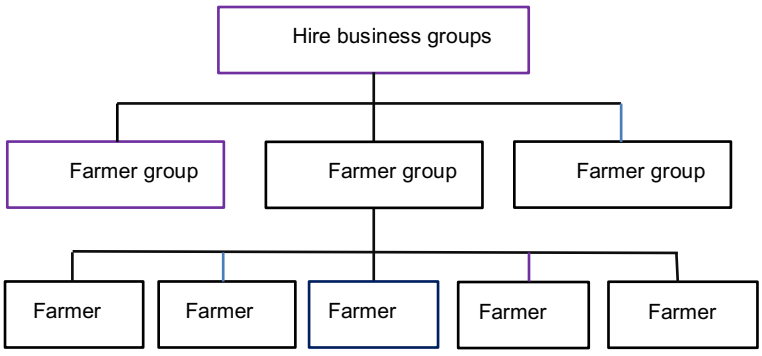

Figure 4. Membership structure of hire business groups.

The hire business groups provide services primarily for farmers who were registered as group members. The procedure to get job order is begun from farmers. At the beginning of growing season, farmers can propose any jobs to group leader to be continued to vice manager in order to make a decision for the job contract between farmers and hire business group. After contract is agreed between farmers and manager, the job can be begun. Farmers must also pay 50% of total payment of the contract as down payment. This payment is used to purchase fuel and oil. The rest will be paid after job completely finish. In few cases, farmers failed to pay off the second

payment due to economic reason. They will pay it after harvesting rice, but there is no interest imposed for delaying the second payment. Such cases have caused financial problems when hire business groups will pay operator wage and repair costs.

Rates of Service Charge

Rates of service charge for various types of farm machinery offered by hire business groups are established based on agreement between village chief, group manager, farmer group leader, and extension officer. The rates are made to include costs of operational machines such as fuel, oil, operator wage, repair and maintenance, and profit for hire business group. Therefore, the rates of service charge differed across hire business group and type machines or operations. The rates offered to group members were lower than rates of private (individual) hire business available in the vicinity. It is because the hire business groups have purpose not only to get profit but also to help small farmers to get farm machinery service to mechanize their farming operations. Hence, small farmers who have not buy or owned machines yet can work their farm using the machines without purchasing them.

Rates of service charge are established under different basis. Tillage operations are calculated in meter square (m^2) and the rates included for irrigation pump. The rates for harvesting, threshing, and milling operations are determined based on kilogram (kg). The rates of charge can differed across groups with the same type of operations. The rates of tillage operations, for example, varied among machine types (moldboard flow, rotary tillers, or hydro tillers), hire service groups, and field conditions (such as weed conditions and distance from the machine centre to the location of farm area). The charge for moldboard flow is the highest rate of tillage operations because the operations are performed twice including primary and secondary tillage. The machine is usually used when paddy field is lack of water supply primarily on dry season. Operators usually use water pump to supply water into the paddy field. The charge included for the water pump operation.

Table 2. Rates of service charge for various types of farm machinery.

Machine types	Operation Types	Calculation basis	Rates (IDR)
Moldboard Flow	Tillage preparations	M^2	200($0.015)
Rotary Tillers			180($0.014)
Hydro Tillers			150($0.012)
Power Thresher	Threshing	KG	300($0.023)
Rice Milling Unit	Milling		500($0.038)

Note: US$ 1 is equivalent to about IDR 13,000 based on the average exchange rate in 2017.

Revenue and Profit

The total revenue and profit derived by hire business groups each operational season is presented in Table 3. The total revenue was obtained as US $3,792.7 and the largest revenue derived from rotary tiller operation. Total cost was required as US $2,690.5 and the highest cost was for rotary tiller operation. With operating five types of machines, hire business groups received profit as US $1,102.2 each operational season. This profit was mostly derived from rotary tiller operation, accounting to US $338. The results showed that hire business groups are viable business model in village areas in Kampar Region. The profit has become an additional income for farmers involved in the business.

Table 3. Revenue and profit derived each machine type managed by hire business groups (US$).

Type of machine	Cost	Revenue	Profit
Moldboard Flow	691.6	970.5	278.9
Rotary Tillers	806.7	1,144.7	338.0
Hydro Tillers	592.1	904.1	312.0
Power Thresher	166.2	201.3	35.1
Rice Milling Unit	433.9	572.1	138.2
Total	2,690.5	3,792.7	1,102.2

4. Conclusions

The small farm machinery hire services were small businesses managed by farmer groups and operated within village area. They managed 2 - 4 kind of farm machines and offered hiring services mainly for their group members with a lower rate of charge. The machinery hire businesses became sources of increasing and diversifying family incomes for smallholder farmers in the region.

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